

Indigenous use of medicinal plants by the Pnar community in East Jaintia Hills District, Meghalaya

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ABSTRACT

The Pnar, commonly known as Jaintia, is a sub-tribe of the Khasi community in Meghalaya. They are indigenous to the West and East Jaintia Hills Districts of Meghalaya. In this study, indigenous use of medicinal plants by the Pnar community has been reported. The field survey was conducted from December 2019 to July 2020 and data was obtained using open-ended semi-structured questionnaires and field observation with traditional healers and local inhabitants of the community. A total of 40 medicinal plants belonging to 24 families were collected and documented. These plant species are widely used by the local communities in ten villages of the East Jaintia Hills District for the treatment of different ailments. As observed from the results, Asteraceae, Euphorbiaceae, and Zingiberaceae are the most prominent families among the identified species. *Chromolaena odorata* (L) R. M King & H. Rob is the most often cited medicinal plant with a Relative Frequency Citation (RFC) of 0.97 followed by *Allium cepa* L (0.93), and *Zingiber officinale* Rosc (0.90). Moreover, the report incorporates the mode of administration and dosage of these herbal medications.

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INTRODUCTION

Since time immemorial, millions of people throughout the world have been inevitably associated with plants for their primary health care and it is well documented.^[1, 2] Medicinal plants are the foundation of resources for both traditional systems and modern medicine^[3] and hence satisfy millions of ethnic and indigenous people living in the rural and urban areas. The interaction between humans and plants has been long described as one of the factors influencing human civilization, especially in medicinal fields.^[4] Medicinal plants are plants containing inherent active ingredients used to cure disease or relieve inexpensively, therefore this is gaining popularity even among the urban elite.^[5] It is a fact that people living in very remote rural areas generally rely on the medicine developed from the plants directly or indirectly. The practice and reliance of ethnic societies on folk medicines are rapidly declining due to changing lifestyles, extreme secrecy of traditional healers, and youth negligence; therefore, ethnobotanical exploitation and documentation of indigenous knowledge about the usefulness of such a vast pool of genetic resources are purposefully needed.^[6, 7] Understanding the importance of ethnomedicinal plant resources is very important in order to develop ideas and actions concerning health and illness. In one form or another, they play a valuable and important role in the economic, social, cultural, and ecological aspects of local communities over the world.^[8] Herbal medicine plays an important role in rural areas, and various locally produced drugs are used as an alternative form of medicine to treat different ailments.^[9] The increasing use of traditional therapies demands more scientifically sound evidence for the principles behind therapies and for the effectiveness of medicines.^[10] The primary objective of this study is to document and preserve indigenous knowledge on medicinal plants use to treat different human ailments by the local traditional healers in ten villages of East Jaintia Hills District, Meghalaya.

MATERIALS AND METHOD

East Jaintia Hills District is one of the 12th districts of Meghalaya, and it is home to one of the state's major tribes, the 'Jaintias' or the 'Pnars'. It covers an area of 2040 sq km area and is situated between 25° 22' 27.7" N latitude and 92° 26' 17.3" E longitude. The district is bounded on the North and East by state of Assam, on the West by the West Jaintia Hills of Meghalaya, and on the South by the International border with Bangladesh.

KEYWORDS:

East Jaintia Hills, Indigenous knowledge, Medicinal plants, Meghalaya; Pnar.

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In order to document the utilization of indigenous medicinal plants, study sites were selected based on the availability of traditional healers and knowledgeable persons identified with the assistance of community leaders, elderly people, and the village headman. Agriculture is the main occupation of the study area. The main food crops grown are rice (*Oryza sativa* Linn.), maize (*Zea mays* Linn.), mustard leaves (*Brassica juncea* L.), etc. Apart from agriculture, the inhabitants had a frequent habit of gathering wild edibles, which they did seasonally or throughout the year, depending on their availability.

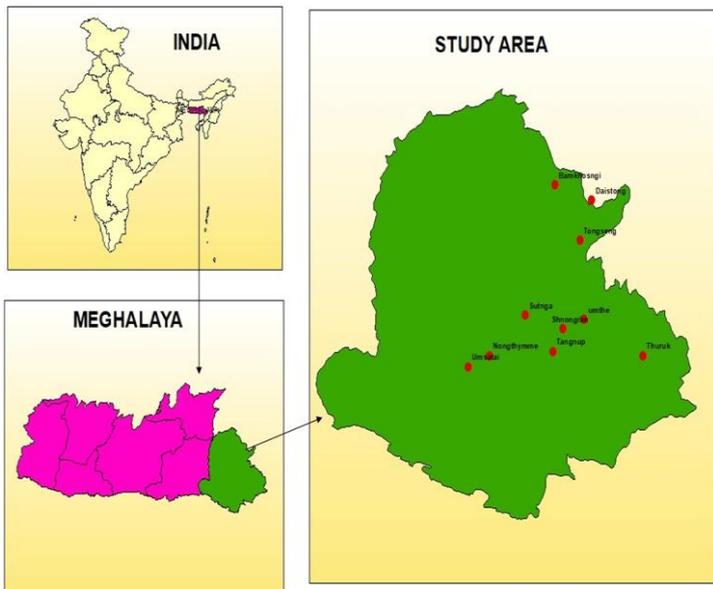


Fig. 1: Location of the study area.

Survey and Data Analysis

An ethnobotanical survey was carried out from December 2019 to July 2020 in ten villages of East Jaintia Hills district of Meghalaya (Figure 1). The study was based on the primary survey and data were collected through open-ended semi-structured questionnaires with informants who knew or used plants as medicine, and according to the convenience of the people. After prior informed consent was verbally obtained, data on age, gender, parts of the plants used, collection and method of use of the drugs, dosage administration, and the purposes for which they were used were documented. Repeated inquiries were made to understand their knowledge, methods of diagnosis, and treatment of the diseases.

The medicinal plants were personally identified by the informants and representative samples were collected and herbarium was prepared for further conservation with standard technique given by Jain & Rao and Maden^[11, 12] and identified with the help of Flora of Meghalaya^[13] and various e floras. For confirmation Botanical survey of India, Shillong was consulted. The information provided by one person was cross-checked with another to authenticate the information acquired. The purpose of the data collection was disclosed to the respondents and their consent was taken for further research work and publications. The collected data were represented systematically in the MS Excel spreadsheet and summarized using descriptively statistical methods such as frequency, percentage, tables and graphs.

The **Frequency of Citation (FC)** and **Relative Frequency of Citation (RFC)** for each medicinal species were determined using the following formula purposed by Tardío and Pardo (2008)^[14]:

$$RFC = FC/N$$

Where, RFC= Relative Frequency of Citation, FC=number of respondents citing the use of medicinal plant species, and N = total number of informants participating in the survey. Relative frequency of citation (RFC) signifies the local relevance of each species in a research area.

RESULTS AND DISCUSSION

Demographic Profile of Informants:

Thirty respondents participated in this study, including 19 (63.33%) men and 11 (36.7%) women. The largest proportion of the respondents was of the elderly, above 51 years old (Table 1). On the basis of education, indigenous knowledge regarding the use of plants treating different types of ailments is more predominant among illiterate people (36.67%) and this knowledge is decreasing in the highly educated class (13.33%). These formants were mostly herbal healers (36.67%) followed by farmers (30.33%), business (13.33%) government servants (10%), and none (6.67%). The overall types of houses in the studied village with pucca-based houses being the highest percentage at 40%, followed by semi-pucca with 33.3% and kutcha with 26.7% (Figure 2).

Table 1: Socio-demographic data of the informants

| Variable | Categories | No. of persons | Frequency |
|--|----------------------------|----------------|-----------|
| Informant category | Local health practitioners | 14 | 46.66 |
| | Local people | 16 | 53.33 |
| Gender | Male | 19 | 63.3 |
| | Female | 11 | 36.7 |
| Age | 31-40 years | 1 | 3.3 |
| | 41-50 years | 7 | 23.3 |
| | 51-60 years | 11 | 36.7 |
| | >61 years | 11 | 36.7 |
| | Illiterate | 11 | 36.7 |
| Educational background | Primary | 5 | 16.7 |
| | Middle | 7 | 23.33 |
| | Matriculate | 5 | 16.67 |
| | >Matriculate | 4 | 13.33 |
| Occupation | Farmer | 10 | 33.33 |
| | Herbal healer | 11 | 36.67 |
| | Government servant | 3 | 10 |
| | Business | 4 | 13.33 |
| | None | 2 | 6.67 |
| Experience of the local health practitioners | 5-15 years | 12 | 40 |
| | 16-25 years | 2 | 6.67 |
| | >25years | 16 | 53.33 |
| Mode of acquisition | Inheritance | 18 | 60 |
| | Experience | 12 | 40 |

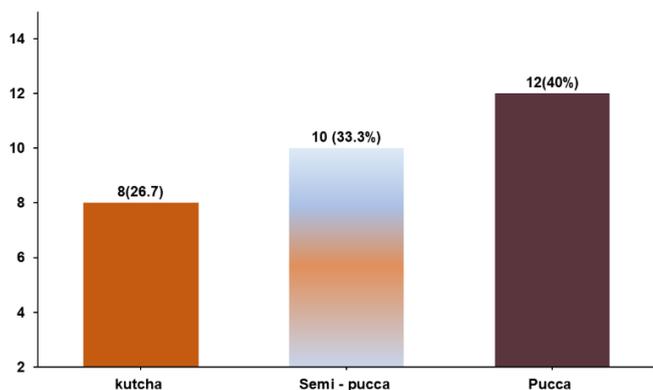


Fig. 2: Structure of the houses in the study area.

Medicinal Plants of the Study Area: A total of 40 ethnomedicinal plants were identified and documented, classified into 36 genera and 24 families. The plants are listed with scientific name, family distribution, local name, the plant parts used, and the various applications for the treatment of different ailments which are discussed in (Table 2). The most commonly represented families were Asteraceae (7 species) followed by Euphorbiaceae, Zingiberaceae (4 species each), many families were represented by single ethnomedicinal plants (Figure 3). Similarly, Hynniewta^[15] reported that the Asteraceae family has the largest number of plant species from a study conducted in pine forest of East Khasi Hills district, Meghalaya This finding might be due to the high accessibility of these species in that region.

The growth form analysis of medicinal plants revealed that herbs accounted for the highest proportion represented by (22 species, 55%), followed by shrubs (8 species, 20%), trees (8 species, 20%), and vines (2 species, 5%) (Figure 4).

The herbs being the highest uses for medical purposes may be due to their easy availability and high effectiveness in the treatment of various ailments in comparison to other growth forms. The local people use different parts of medicinal plant species for the preparation of traditional remedies. They primarily use leaves (N =16) which is consistent with the findings of Myrchiang^[16], followed by the entire plant (N = 9), roots/rhizomes (N = 6), fruits/seeds (N = 5) bark (N = 4), bulb (N = 3), flowers (N = 3), stem (N = 1) and rootstock (N = 1) of the plant are presented in (Figure 5). The above-ground plant parts are utilized more for medicine than the underground parts.

It is observed that most of the remedies consisted of a single plant part and more than one way of preparation. However, some of the remedies consisted of different portions of the

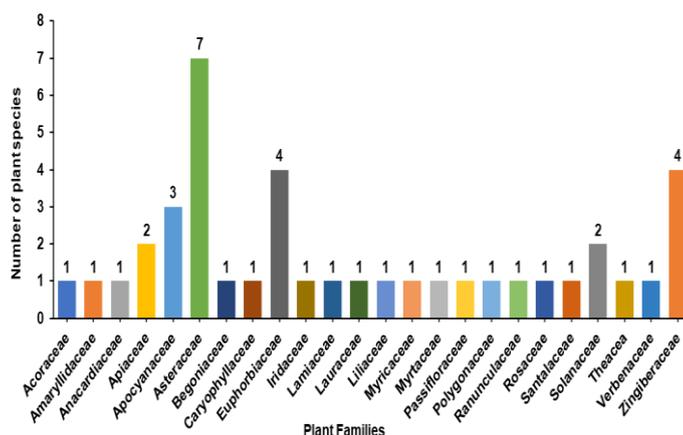


Fig. 3: The taxonomic diversity of the medicinal plants in East Jaintia Hills.

Table 2: Medicinal plants used by the inhabitants of East Jaintia Hills

| S. No | Botanical Name | Family | Local name | Therapeutic uses | FC | RFC |
|-------|--|----------------|----------------|---|----|------|
| 1 | <i>Acmella paniculata</i> (Wall ex DC.) R.K.Jansen | Asteraceae | Phlang lymmein | Inflorescences are crushed and applied twice daily to relieve toothache and cure cavity formation. | 13 | 0.43 |
| 2 | <i>Acorus calamus</i> L. | Acoraceae | Khah-mat | Decoction of the whole plant is administered once a day to cure stomach aches, dysentery, and diarrhea; also, small pieces of rootstock are chewed to relieve toothache. | 16 | 0.53 |
| 3 | <i>Ageratum conyzoides</i> Linn. | Asteraceae | Ymbat phareng | Crushed leaves are applied on cuts to control bleeding. | 25 | 0.83 |
| 4 | <i>Allium cepa</i> L. | Amaryllidaceae | Piat | The fresh bulb is taken raw against running nose, coughing, and tonsillitis. | 28 | 0.93 |
| 5 | <i>Allium sativum</i> Linn. | Liliaceae | Rasun | 9-10 pieces of the bulb are fried lightly in ½ liter of mustard oil, filtered oil is used as a massage oil for newborn baby and against joints pain; 1-2 drops are poured in the nostril to reduce stuffy nose and sore throat. | 26 | 0.83 |
| 6 | <i>Alstonia scholaris</i> (L) R.Br. | Apocyanaceae | Dein thlen | An aerial portion is boiled, and the decoction is taken once a day to lower blood pressure. | 8 | 0.27 |
| 7 | <i>Anemone rivularis</i> Buch. - Ham. ex DC. | Ranunculaceae | Phlang sinus | Fresh leaves are crushed and inhaled through nostrils for sinusitis. | 3 | 0.10 |
| 8 | <i>Begonia urphylla</i> Hook. | Begoniaceae | lajo | Root decoction 1-2 teaspoonful daily is given against stomachache. | 5 | 0.17 |
| 9 | <i>Bidens pilosa</i> L. | Asteraceae | Sapyrthit | Leaves and stems are crushed then taken orally or applied to the injured tissues for curing snakebite and are also taken along with the whole plant of <i>Elephantopus mollis</i> to get rid of urinary disorders. | 10 | 0.33 |

| S. No | Botanical Name | Family | Local name | Therapeutic uses | FC | RFC |
|-------|--|-----------------|-----------------|---|----|------|
| 10 | <i>Catharanthus roseus</i> (L.) G. Don | Apocyanaceae | Syntu | 2-3 pieces of leaves or flowers are chewed and the juice is swallowed once a day to reduce obesity, diabetes, and Stomached. | 22 | 0.73 |
| 11 | <i>Centella asiatica</i> (L.) Urb. | Apiaceae | Sla takheh | Decoction of the whole plant is taken against high blood pressure, chronic ulcer, and dysentery. | 19 | 0.63 |
| 12 | <i>Chromolaena odorata</i> (L.) R. M King & H. Rob | Asteraceae | Burma lieh | Leaf paste is applied to the cuts and wounds to stop bleeding. Whole plants along with tender leaves of <i>Psidium guajava</i> and <i>Rubus ellipticus</i> are useful for diarrhea and dysentery. | 29 | 0.97 |
| 13 | <i>Clerodendrum glandulosum</i> Lindl. | Verbenaceae | Sla iarem | Leaves are boiled in water for 10-15 minutes against hypertension and also consumed as curry. | 6 | 0.20 |
| 14 | <i>Crassocephalum crepidiodes</i> (Benth.) S. Moore | Asteraceae | lali | Decoction of the leaf is taken twice daily to cure hypotension and indigestion. | 8 | 0.27 |
| 15 | <i>Croton caudatus</i> Geiseler | Euphorbiaceae | Dein cancer | Whole plants are boiled in water for about half an hour and then water bath is used for bathing stroke patients, and decoction of bark and roots is taken orally, twice a day, for all types of cancer. | 6 | 0.20 |
| 16 | <i>Croton macrostachyus</i> Hochst. ex Delile | Euphorbiaceae | Dein lakhar | The ashes are mixed with water and filtered through a thin cloth, applied externally against skin rashes and hives. | 2 | 0.07 |
| 17 | <i>Curcuma caesia</i> Roxb. | Zingiberaceae | Shyrmitt iong | Decoction of <i>Curcuma caesia</i> (rhizome) and <i>Rubia cordifolia</i> (stems) is given to babies up to 3 years and to lactating mothers to prevent stomach ached | 4 | 0.13 |
| 18 | <i>Curcuma longa</i> L. | Zingiberaceae | Shyrmitt | Fresh rhizomes juice is taken orally every morning for expelling kidney and gall bladder stones; paste prepared from a fresh rhizome with honey is used to heal skin disorders. | 18 | 0.60 |
| 19 | <i>Drymaria cordata</i> (L.) Willd. Ex Roem & Schult | Caryophyllaceae | Piat-piat | The ground leaf paste is applied thickly over the snake-bitten part and ringworm until the infection subsides. | 8 | 0.27 |
| 20 | <i>Duchesnea indica</i> (Jacks.) Focke. | Rosaceae | Sla piles | Its juice is taken twice daily useful in piles. | 7 | 0.23 |
| 21 | <i>Eleutherine bulbosa</i> (Mill.) Urb. | Iridaceae | Piat-saw | The dried bulb is powdered and taken orally with lukewarm water twice a day for 3-5 days for cough. | 13 | 0.43 |
| 22 | <i>Eryngium foetidum</i> L. | Apiaceae | Mukhor | Whole plants are eaten raw as a salad for constipation and stomachic. | 18 | 0.60 |
| 23 | <i>Fagopyrum acutatum</i> Lehm. Mansf. ex K. Hammer. | Polygonaceae | larain | Cooked as vegetables to balance hypertension, diabetes and constipation. | 16 | 0.53 |
| 24 | <i>Gynura bicolor</i> Roxb. ex Willd.) DC. | Asteraceae | laliiong | Grind the leaves and add 20gm of jaggery in ½l of water against hypotension. | 23 | 0.77 |
| 25 | <i>Kaempferia galanga</i> L. | Zingiberaceae | Phlang lyngdong | 1 teaspoon of the grounded powder is mixed in ½ liter hot water and is taken twice a day against urinary tract infections. | 18 | 0.60 |
| 26 | <i>Litsea cubeba</i> (Lour.) Pers. | Lauraceae | Soh lu | Leaves and bark paste mixed with mustard oil in case of bone fracture or muscle and back pain. | 6 | 0.20 |
| 27 | <i>Mikania micrantha</i> Kunth. | Asteraceae | Rme japan | Crushed leaves are used externally against hornet stings and to stop bleeding. | 19 | 0.63 |
| 28 | <i>Myrica esculenta</i> Buch. Ham. ex D. Don. | Myricaceae | Sli-ia | Fruit juice is taken twice daily for digestion. | 23 | 0.77 |
| 29 | <i>Passiflora edulis</i> Sims. | Passifloraceae | Sabrab | Decoctions of leaves for decreasing high blood pressure and diabetes; when mixing with <i>Psidium guajava</i> and <i>Smilax spp</i> leaves, the infusion can cure blood dysentery. | 15 | 0.50 |
| 30 | <i>Phyllanthus emblica</i> Linn. | Euphorbiaceae | Saplo | 2-4 pieces of fruits eaten every day for the treatment of scurvy. The fermented juice when mixed with <i>Curcuma longa</i> and <i>Piper nigrum</i> is good for cough and constipation. | 27 | 0.90 |

| S. No | Botanical Name | Family | Local name | Therapeutic uses | FC | RFC |
|-------|---|---------------|-----------------|--|----|------|
| 31 | <i>Plectranthu sternifolius</i> D. Don. | Lamiaceae | Phlang-rih | Decoction of the dried plant is taken daily for feverish conditions. | 16 | 0.53 |
| 32 | <i>Psidium guajava</i> Linn. | Myrtaceae | Sapriam | Tender shoots are taken directly either by chewing or decocted when mixed with <i>Rhus semialata</i> for the treatment of diarrhea, cholera, and dysentery. | 21 | 0.70 |
| 33 | <i>Rhus semialata</i> Murray | Anacardiaceae | Sohbluh | Fruits decoction is consumed to control diabetes. | 20 | 0.67 |
| 34 | <i>Ricinus communis</i> Linn. | Euphorbiaceae | Sla myrda | Bathing in water boiled with leaves help to soothe and get rid of body aches and pain. | 11 | 0.37 |
| 35 | <i>Schima wallichii</i> Choisy. | Theaceae | Deinngan | Decoction of bark or leaves is taken to relieve dysentery and diarrhea. | 21 | 0.70 |
| 36 | <i>Solanum aculeatissimum</i> Jacq. | Solanaceae | Chieh khorkhali | The smoke of burnt fruits and seeds is inhaled through the mouth to relieve toothache. | 6 | 0.20 |
| 37 | <i>Solanum indicum</i> L. | Solanaceae | Synthang khian | Fruits are consumed as a salad to lower blood pressure. Seeds are pounded and applied on skin rashes for 10-15 minutes and wash it with cold water. | 13 | 0.43 |
| 38 | <i>Tabernaemontana divaricata</i> (L) R.Br. ex Roem & Schull. | Apocyanaceae | Syntu-khla | Leave paste is mixed with mustard oil and applied on the forehead against headache and bone fracture. | 7 | 0.23 |
| 39 | <i>Viscum articulatum</i> Burm. | Santalaceae | Mangkariang | The whole plant along with <i>Acorus calamus</i> <i>Rubia cordifolia</i> (root-stock) and <i>Eleutherine bulbosa</i> (bulb) is boiled in water until the color of the solution becomes red, then small pieces of <i>Alpinia galangal</i> is added. This medicine is locally known as “dawai khniangsapet”. It is given to newborn babies up to 3 years and to lactating mothers to prevent stomach troubles. | 9 | 0.30 |
| 40 | <i>Zingiber officinale</i> Rosc. | Zingiberaceae | Sying | Decoction of the whole plant with honey for curing cough, tonsillitis, and fresh paste can soothe hives. | 27 | 0.90 |

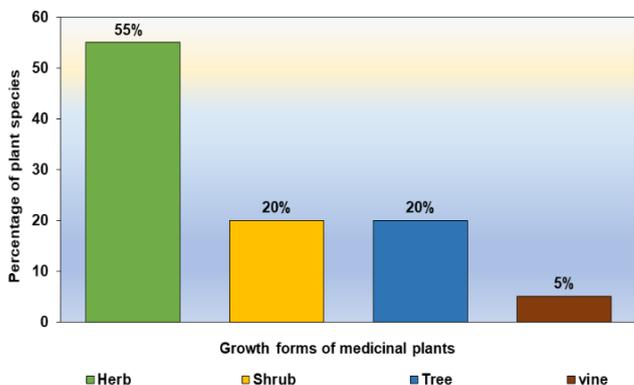


Fig. 4: The growth habits of medicinal plants are used to treat various ailments.

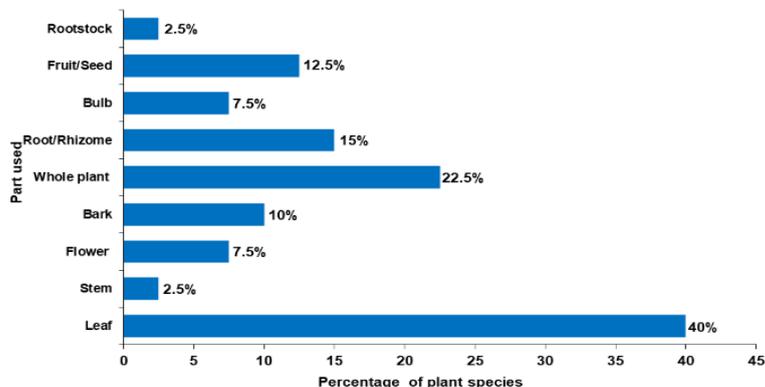


Fig. 5: Proportion of different plant parts are used in the preparation of ethnomedicines in the study area.

same plant species to treat one or more diseases. Decoction and paste of plant parts were the most common methods of preparation. Plant decoction is extracted by crushing plant parts and sometimes plant parts are boiled with water and the liquid is decanted. The remedies are prepared either from freshly gathered plant parts or dried plant parts, depending on their intended function, and are either administered orally. The most commonly treated diseases were hypertension, stomach problems and dysentery, diabetes and diarrhea (Figure 6). Furthermore, the use of plant species for specific categories of ailments and diseases is presented in (Table 2).

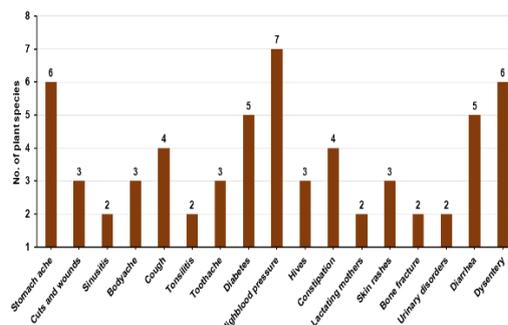


Fig. 6: Disease and ailments categories with number of plants.

Relative Frequency of Citation

From the present study, the Relative Frequency of Citation varied from 0.07 to 0.97 for all the species. *Chromolaena odorata* (L) R. M. King & H. Rob, which belongs to the Asteraceae family, had the highest RFC (0.97), which was followed by *Allium cepa* L. (0.93), and *Zingiber officinale* Rosc. (0.90) (Table 2). High RFC values for the ethnomedicinal plant species indicated their extensive use, easily available and widespread knowledge among the indigenous communities. *Croton macrostachyus* Hochst. ex Delile which is commonly known as Dein lakhar, has the least RFC of 0.07 among the frequently quoted species. Conversely, *Ageratum conyzoides* Linn. (FC-23), *Myrica esculenta* Buch. Ham. ex D. Don. (FC-23), and *Rhus semialata* Murray (FC-20) were abundantly distributed in the research area.

CONCLUSION

The present study highlighted that the local traditional healers of the study area, are rich in ethnomedicinal knowledge. These ethnomedicinal plants are also the source of income for the local traditional healers. With the development and modernization taking place at a fast pace, the old traditional knowledge that has been so valuable guarded, and practiced once is now losing its place to the more reliable and trusted scientific approach associated with modern medicine. The younger generations do not favor the value placed by their ancestors about the herbal use in lesser common diseases like fever, stomach ache, minor injuries, etc. However, the old practices about the uses of medicinal plants still exist in the study area. The availability of medicinal plants is slowly declining due to rampant destruction of forests, unsustainable exploitation, and agricultural expansion. Therefore, it is now felt that conservation and preservation of these species, creating awareness, developing a proper protocol on the agronomics for the cultivation of these medicinal plants and pharmacological studies are the needs of the hour. As a result, research on the documentation of ethnomedicines could be expanded to other areas for the protection of traditional knowledge and to provide a base line for future studies.

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Authors' contributions: F. Bamon: Carried out the survey, data collection, identification of ethnomedicinal plants, data analysis, and drafted the manuscript. Lalnundanga: Revision, conceptualization, and supervision of the manuscript. Both the authors read and approved the final submission of this manuscript.

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